

THE USE OF PROBLEM-BASED LEARNING TO ENHANCE
CRITICAL THINKING SKILLS IN
BACCALAUREATE NURSING STUDENTS

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ABSTRACT

RESEARCH PAPER: The Use of Problem-Based Learning to Enhance Critical
Thinking in Baccalaureate Nursing Students

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Critical thinking skills are essential for graduate nurses to function effectively in complex healthcare environments. Nurse educators are faced with the task of utilizing teaching methods which encourage the use of higher order thinking, and developing critical thinking skills of students. The purpose of this quasi-experimental study is to determine if critical thinking skill are enhanced using problem-based learning as measured by the California Critical Thinking Dispositions Inventory (CCTDI). Semi-structured interviews will also be conducted to obtain qualitative data. This is a replication of Tiwari, Lai, So and Yuen's (2006) study. The framework is Lewin's Force Field Learning Theory (1944) as it relates to human motivation. The target population is baccalaureate nursing students attending universities in northwestern Pennsylvania. The anticipated sample is 100 baccalaureate nursing students. The results of this study will offer insight into whether problem-based learning can serve as an effective teaching strategy for educators to enhance critical thinking skills in nursing students.

Chapter I

Introduction

The healthcare professions have witnessed significant changes over the past 2 decades. The effects of advancing technology, an aging population, cultural diversity, increasingly savvy health care consumers, globalization, environmental changes and the current nursing shortage have all had an impact on the profession of nursing (American Association of Colleges of Nursing, 2010; Institute of Medicine, 2010a; Warner & Misener, 2009). As a result of these factors, hospitals have become more complex organizations (Institute of Medicine, 2010b). New and innovative technologies are being introduced. However there has been a gap in the transitioning of technology into the healthcare arena (Institute of Medicine, 2010b). In addition, consumer demand for safety and quality in healthcare is rising (American Association of the Colleges of Nursing, 2010). Despite the changes in the health care environment, the expectation remains that nurses will provide culturally competent, safe, effective, quality care to acutely ill patients.

Growing concerns for patient safety in healthcare have emerged in recent years. Fero, Witsberger, Wesmiller, Zullo and Hoffman (2009) acknowledged that growing concerns for patient safety are emerging worldwide. The Institute of Medicine (2010b) addressed many issues related to patient safety, including adverse drug events, and infections, are other preventable events. Optimizing patient safety requires nurses to be

expert clinical decision-makers and critical thinkers to recognize changes in patients' conditions, to prioritize care, and provide safe and effective nursing interventions (Fero et al., 2009; Jacobson, Belcher, Sarr & Ruita, 2010).

Due to the escalating changes in health care, nurses are faced with increased demands. Nurses must function effectively amidst ongoing changes in technology and practice. Possessing higher order thinking skills is not only necessary, but essential for nurses entering the workforce.

It has been suggested that a crisis in critical thinking skills of new graduate nurses exists, with only about 1/3 of graduates meeting entry level expectations for clinical judgment (Del Bueno, 2005, p. 278). The ability to deliver quality, safe and effective nursing care begins with nursing education. Faculty need to address the issue of clinical decision-making in both classroom and clinical settings. Nurse educators must consider alternative methods for educating future nurses. Four major shifts must occur in nursing education to ensure success for future nurses:

1. From a focus of teaching soon-to-be obsolete facts to an emphasis on teaching for a sense of salience, situated cognition and action in particular situation;
2. From a distinct separation of clinical and classroom teaching to integration of classroom and clinical teaching;
3. From an emphasis on critical thinking to clinical reasoning and multiple ways of thinking which include critical thinking;
4. From an emphasis on socialization and role taking to an emphasis on formation (Tanner & Bellack, 2010, p. 124).

Key organizations are concerned with the development of critical thinking within the context of nursing education. The National League for Nursing Accrediting Commission (NLNAC) and the American Association of Colleges of Nursing (AACN) have recognized the need for nursing education to prepare graduates for competency in practice. The National Advisory Council on Nurse Education and Practice (NACNEP) (2008) recognized that consumer demands for quality care, advancing technology, financial pressures, increased demands on the health care system due to an aging population, and a shortage in the nursing workforce, have impacted on nursing practice. Furthermore, the NACNEP (2008) acknowledged that these factors have presented challenges to both employers of nurses and nurse educators. The NACNEP suggested that it is more vital than ever before to ensure that educational and practice opportunities exist for both experienced nurses and newly graduated nurses to meet the demands of the health care environment.

The rapidly changing health care environment requires nurses with strong critical thinking and analytical skills as well as the ability to provide professional and compassionate care. These critical thinking and analytical skills are required to acquire and assimilate data in order to make appropriate patient care decisions (NACNEP, 2008, p. 6).

The NLN and the AACN also recognize the impact that challenges in the health care environment have on the profession of nursing and nursing education. The NLNAC (2008) and the AACN (2008) require nursing programs to provide evidence of student outcomes related to critical thinking/clinical judgment. According to the AACN *Essentials of Baccalaureate Education* (2008) one expected outcome of nursing

education is “the baccalaureate generalist graduate is prepared to use clinical/critical reasoning to address simple and complex situations” (p. 8). The expectations of accrediting bodies require nursing education to reexamine nursing curricula and teaching strategies to ensure students meet the needs of today’s health care consumers.

Determining instructional strategies which enhance critical thinking abilities of nursing students has been of interest to nurse educators and a focus of nursing research for 2 decades (Riddell, 2007; Scheffer & Rubenfeld, 2000). Teaching methods for clinical identified in the nursing literature to enhance critical thinking in nursing students include: clinical post-conferences (Hsu, 2007); writing assignments such as clinical/reflective journals (Craft, 2005; Crowe & O’Malley, 2006); simulations (Horan, 2009; Ravert, 2008; Rush, Dyches, Waldrop & Davis, 2008).

Classroom methods identified in the literature include: group discussion (Platzer, Blake & Ashford, 2000); group dynamic sessions (Khosarvani, Manoocherhi & Memarian, 2005); case studies (Tomey, 2003); concept mapping (Abel & Freeze, 2006; Daley, Shaw, Balisteieri, Glasenapp & Piacentine, 1999; Wheeler & Collins, 2003); classroom debates (Candela, Michael & Mitchell, 2003); and problem-based learning (PBL) (Jones, 2008; Tiwari, Lai, So & Yuen, 2006; Yuan, Kunaviktikul, Klunkin & Williams, 2008). As an instructional method PBL has been shown to improve students’ clinical knowledge, clinical reasoning, learning autonomy and motivation toward learning (Dehkordi & Heydarbejad, 2008; Tiwari et al., 2006).

Historically the focus of nursing education was on teaching a set of skills which allowed nurses to practice in a variety of health care settings. Nurse educators recognize

the need for learners to possess the ability to think critically, but are faced with the challenge of identifying teaching methods which will foster critical thought. Problem-based learning (PBL) offers an innovative and engaging learner-centered approach to enhancing nursing students' ability to think critically. Findings related to the use of PBL as a teaching method to enhance critical thinking have been mixed. Some researchers have found while PBL improves meta-cognition and problem-solving skills it does not improve critical thinking skills (Choi, 2004; Magnuseen, Ishida & Itano, 2000). The majority of research on PBL however shows promise in the use of PBL to promote critical thinking. Joe and Elizabeth (1999) found nursing students who participated in a 1-year PBL course showed improved critical thinking.

Additional studies have found PBL effective in promoting group participation, collaboration, and communication while enhancing student ability to think critically (Cook & Moyle, 2002; Morales-Mann & Kaitell, 2001). PBL has been shown to improve both critical thinking skills and dispositions of nursing students (Day & Williams, 2002; Tiwari et al., 2006). Studies in Mainland China have recognized the benefits of PBL as improving self-directed learning and cooperative group work while improving critical thinking (Yuan & Qian, 2003; Yuan, Kunaviktikul, Klunklin & Williams 2009). When compared with traditional lecture, PBL has been shown to be more effective in fostering critical thinking skills of nursing students (Dehkordi & Heydarbejad, 2008; Tiwari et al., 2006).

Background and Significance

The concept of critical thinking dates back over 2,500 years to Socrates. Socrates suggested students should be provided with questions, not answers. Socratic questioning is a logical and systematic form of inquiry with each subsequent quest allowing for further inquiry into a topic of deeper thought (Foundation for Critical Thinking, 2009). Many individuals have examined the concept of critical thinking since Socrates. Plato, Aristotle, Bacon, and Descartes are among the many who have offered insight into the concept of critical thinking. Despite the fact that critical thinking is not a new concept, there has been a lack of consensus on the definition of critical thinking in nursing education and how critical thinking should be measured (Scheffer & Rubenfeld, 2000; Tanner, 2005; Staib, 2006).

The concept of critical thinking in education was first discussed in the 1950's. In the past 20 years, nurse educators have come to realize the importance of critical thinking in nursing education despite a consensus on the definition of critical thinking. In 2003 the National League for Nursing (NLN) called for radical reform in nursing education (NLN, 2003). More recently, the NLN's expectation is that evidence of critical thinking be provided as an outcome of nursing education (NLN, 2008).

In 1990 the American Philosophical Association (APA) Delphi Commission, a panel of 46 experts representing multiple disciplines, released a consensus definition of critical thinking. The most frequently cited definition of critical thinking in the nursing literature is the APA Delphi definition (Turner, 2005) which recognizes 6 cognitive skills and 10 dispositional components to critical thinking. The APA Delphi Commission's

definition of critical thinking has been used extensively to establish teaching measures and to assess critical thinking ability (Facione & Facione, 2008, p. 1).

Problem-based learning (PBL) was developed and initially utilized in medical education at McMaster University in Ontario, Canada in the late 1960's. PBL presents students with a problem or situation to apply previous knowledge and acquire new knowledge. It has been recognized as an instructional method to increase motivation for learning (Sherwood, 2004). Savery (2006) suggested this learner-centered approach "empowers learners to conduct research, integrate theory into practice, and apply knowledge and skills to develop a viable solution to a defined problem" (p. 12). While the instructional method of PBL was originally used in medical education, it has been considered a relevant and appropriate teaching method for other health professions as well (Barrows & Tamblyn, 1980). Research examining the use of PBL to enhance critical thinking in nursing students is limited.

Tiwari et al. (2006) examined the use of PBL as an instructional method to enhance critical thinking. The study of 79 baccalaureate nursing students enrolled in a program in China compared critical thinking dispositions of two groups of students, one group using PBL and one group of traditional lecture students. The researchers found PBL students showed greater critical thinking abilities after completing the course than traditional lecture students. PBL students believed the instructional method provided an active learning experience which encouraged deeper thought. In addition, PBL students were more motivated to learn and enjoyed the experience. Further research is needed to determine if PBL is an effective teaching strategy to promote critical thinking

Problem Statement

Critical thinking skills are essential for professional nursing practice. While there is consensus on the importance of this mandate, there is lack of agreement on the best teaching practices for enhancing critical thinking in nursing students (Tiwari et al., 2006). Problem-based learning is one promising teaching strategy that needs further comparative studies with Baccalaureate nursing students.

Purpose

The purpose of this study is to compare two teaching methods using problem-based learning and traditional lecturing on critical thinking dispositions in Baccalaureate nursing students. This is a modified replication of Tiwari et al.'s (2006) study.

Research Question

Are there differences in critical thinking dispositions of two groups of Baccalaureate nursing students, one group that has a problem-based learning approach (PBL), and another group that has a traditional lecture approach?

Theoretical Framework

Lewin's Force Field Theory serves as theoretical framework for this study. Lewin's (1944, 1951) assertions on human motivation related to field theory can readily be applied to nursing students. If nursing students value critical thinking, and have an inherent motivation to become critical thinkers, the goal of becoming critical thinkers will become a positive valence in the life space of the nursing students. The student will move from region to region of the life space with tension decreasing and force increasing as they near the goal of being a critical thinker. Providing students with instructional

strategies which decrease tension in the life space will increase students' ability to move toward the goal of critical thinking.

Definition of Terms

Critical Thinking Disposition: Conceptual.

Critical thinking has been defined in many ways. As suggested by the American Philosophical Association (APA) Delphi Committee critical thinking can be conceptualized as both cognitive skills as well as affective dispositions and will serve to define critical thinking in this study. The APA Delphi Commission's definition of critical thinking is as follows:

purposeful, self-regulatory judgment which results in regulatory judgment which results in interpretation, analysis, evaluation, and inference as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. CT is essential as a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fairminded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical

thinkers means working toward this ideal. It combines developing CT skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society (Facione, 1990, p. 2).

Critical thinking: Conceptual.

The APA Delphi Commission (1990) identified essential cognitive skills for inquiry and development of the ideal critical thinker:

habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit “(Facione, 1990, p. 2).

Critical thinking: Operational.

Student critical thinking will be operationalized by the total and subscale scores on the California Critical Thinking Disposition Inventory (Facione & Facione, 1992) in this study. The numeric score is based upon the seven subscales of truthseeking, openmindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity of judgment and the total score for the instrument.

Traditional Lecture: Conceptual.

The conceptual definition of traditional lecture is a passive form of learning which involves “teacher presentation of learning, usually accompanied by some type of visual

aid or handout” (Rowles & Russo, 2009). The primary objective of traditional lecture is the transmission of teacher knowledge on a given topic (Tiwari et al., 2006).

Traditional Lecture: Operational.

In this study traditional lecture is defined as “a period of uninterrupted talk from an instructor lasting 2-3 hours (Tiwari et al., 2006, p. 549).

Problem-based learning: Conceptual.

For this study problem-based learning is that “which results from the process of working towards the understanding or resolution of a problem” (Barrows & Tamblyn, 1980, p. 1). It is an instructional learner-center approach that allows learners to integrate theory into practice and apply existing knowledge to develop solutions to a defined problem (Savery, 2006).

Problem-based learning: Operational.

Problem-based learning in this study will refer to an active teaching and learning strategy in which case studies constructed from actual patients will be used to trigger discussion, reflection, and problem-solving among students (Tiwari et al., 2006, p. 549).

Limitations

Generalizability of the study may not be feasible due to the sample being drawn from a single university in Northwestern Pennsylvania. A relatively small sample size may threaten external validity. Limiting the study to nursing students does not allow findings to be generalized to other groups of students.

Assumptions

This study is grounded by the following assumptions:

1. Students will possess the inherent motivation to become critical thinkers and will work towards the goal of becoming critical thinkers.
2. PBL will serve as an engaging learning experience in which students will actively participate.
3. Students will provide honest responses when completing the CCTDI.

Summary

The rapid changes in health care have served as a catalyst for reform in nursing education. To meet the requirements of accrediting agencies and societal demand for graduate nurses to employ sound clinical judgment in the complex and advancing health care arena, nurse educators must utilize instructional methods which will enhance students' critical thinking abilities. Problem-based learning (PBL) is an instructional method which holds promise for enhancing nursing students' ability to think critically. It is a learner-centered approach which has been shown to enhance critical thinking abilities while engaging students and providing motivation for learning (Barrows & Tamblyn, 1980; Sherwood, 2004). The purpose of this study is to determine if PBL is an effective teaching method to develop critical thinking in nursing students and confirm findings of Tiwari et al. (2006). The study framework is Lewin's Force Field Theory as it relates to human motivation.

Chapter II

Literature Review

Introduction

Rapid changes in the healthcare environment and the increasing complexity of the nursing profession demand that graduate nurses possess critical thinking skills. The use of high order thinking is imperative in the nursing profession to ensure patients receive safe, quality care. Nurse educators are faced with the task of incorporating teaching methods which foster critical thinking among nursing students.

Purpose

The purpose of this study is to determine if problem-based learning is an effective teaching strategy to enhance critical thinking skills of baccalaureate nursing students. This is a modified replication of Tiwari et al.'s (2006) study.

Organization of the Literature

The literature reviewed covered selected studies which examined aspects of critical thinking in nursing education. The literature review has been divided into the following four sections:

1. Theoretical framework: Lewin's field theory (1935)
2. Teaching methods to enhance critical thinking skills
3. Comparison of students on critical thinking skills
4. Faculty critical thinking skills

Theoretical framework

Lewin's (1944, 1951) assertions regarding human motivation are deeply rooted in his force field theory. Force Field theory was developed using principles from both physics and geometry. Three principle assumptions of Lewin's force field theory are as follows:

1. Behavior is determined by the field as it exists at any given moment in time.
2. Analysis of behavior must consider the whole situation.
3. The concrete person in a concrete situation can be represented mathematically (Hall & Lindzey, 1978)

Lewin (1944, 1951) believed behavior is determined by both the person (P) and the environment (E). Environment includes both physical and psychological factors acting upon the individual. Together the person (P) and the environment (E) comprise the life space. The life space consists of all factors, both physical and psychological, which determine behavior at any moment in time. The life space consists of many regions. Each region in the life space has adjacencies (adjacent regions) and boundaries (Weiner, 1996, p. 115)

The way in which an individual perceives the environment is dependent upon needs, values, attitudes and motives of the individual. The actions of an individual are

determined by both the person and the environmental components. Lewin (1944, 1951) explains behavior using the following formula: $B = f(P, E)$

In this equation **B** represents behavior, **f** represents some function or relationship, **P** represents person and **E** represents environment (Weiner, 1996, p 115).

Direction in life space relates to movement between two regions within the life space. Various paths can be chosen to move from one region in the life space to another region. While some boundaries within the life space can be difficult to cross, others are more permeable. Individuals move toward a region or away from a region. In a region of the life space a valence may exist. A valence represents how attractive an object, an activity or a goal is. The amount of valence an object possesses is directly related to how desirable the object is to the individual. A region in the life space with a valence becomes the center of a force field. When a psychological force exists, such as a need or desire, this force will result in movement within the life space toward that region. The magnitude of the valence is dependent on how desirable the goal is. Lewin (1944, 1951) represented the force on a person to reach a goal in an equation where **f** represents force, **Va** represents valence, **G** represents goal, **t** represents tension, and **e** represents distance. Tension is greatest when the individual is farthest from the desired object or goal, and when the need has not yet been met. When psychological forces exists, there is movement in the life space toward the desired object or goal. Tension decreases as the individual becomes closer to fulfilling need and force increases as individuals become closer to fulfilling the need (Weiner, 1996, p.122).

Lewin's (1944, 1951) assertions on human motivation related to field theory can readily be applied to this study. If a nursing student values critical thinking and has a strong need or desire to become a critical thinker, the goal of becoming a critical thinker will become a positive valence in the life space of the nursing student. The student will move from region to region of the life space, decreasing tension and increasing force as the student nears the goal of being a critical thinker.

Teaching Methods to Enhance Critical Thinking:

Educational preparation of undergraduate nursing students must include teaching strategies which allow students to develop critical thinking skills in a variety of clinical settings, including community health settings. Sandor, Clark, Campbell, Rains, and Cascio (1998) believed the use of practice-based scenarios in a community health course would allow students the opportunity to explore community issues, develop hypotheses, and create solutions to enhance critical thinking skills. The researchers utilized a pretest - posttest one group design to evaluate the effectiveness of a scenario-based community health nursing course to enhance critical thinking skills.

The participants were senior nursing students (N=54) recruited from a variety of educational institutions across the US. The sample was primarily female (89%). Participants' ages ranged from 20-55 years, with a mean age of 29 years. Forty-three percent of the participants were single, 39% married, and the remainder divorced (11%) or remarried (7%). Participants had taken pre-nursing courses in a variety of academic settings. The majority of students (60%) took pre-nursing courses at junior colleges. The remaining students were from small, 4 year universities with less than 10,000 students

(11%), midsized 4 year universities with populations of 10,000 to 30,000 students (13%), and from 4-year universities with populations of greater than 30,000 students (15%) (Sandor et al., 1998, p. 25).

Students were given case scenarios related to community health problems such as IV drug use, teen pregnancy, and caring for a dependent elder. Students initially participated in large groups, and during that time the teaching strategy was explained. Students were then divided into small groups to analyze case scenarios. Students met again in large group forums to report on after specific questions regarding case scenarios had been answered. Faculty facilitated the first small group sessions, and students then assumed the role of group facilitators. In large group sessions faculty challenged students to use higher order thinking in relation to case scenarios. Throughout the process, faculty provided consultation as needed. Students participated in approximately 30 hours of small and large group sessions for 2 weeks, and then applied the information in a community health setting 2 days per week for a period of 5 weeks (Sandor et al., 1998).

An investigator developed questionnaire was used to collect demographic data which included: age, gender, marital status, number of children, religion, and the type of educational setting for pre-nursing courses. Critical thinking skills of participants were evaluated twice during the study at Time 1 (at the beginning of the semester), and again 7 weeks later at Time 2 (the end of the semester). The Watson-Glaser Critical Thinking Appraisal (Forms A & B), consisting of 80 items, was used to assess CT skills of students. The WGCTA is composed of the following five subscales, each with 16 questions that examine the following aspects of CT: inference, assumptions, deduction,

interpretation, and evaluation (Sandor et al., 1998, p. 24). The WGCTA Form A was used as a pretest at Time 1, and Form B was used as a posttest at Time 2. Reliability of the WGCTA has been established by stable split-half reliability coefficients ranging from .69 to .85. Validity has previously been established by using the test in a variety of settings and for different purposes (Sandor et al., 1998).

The researchers found students' overall critical thinking skills improved significantly as evidenced by the WGCTA total scores from Time 1 to Time 2. From the beginning of the semester (Time 1), to the end of the semester (Time 2), students showed significant improvement on the subscales of interpretation and evaluation as well suggesting the scenario based community health course was effective in improving specific CT skills. Students who completed nursing prerequisites in mid-sized 4-year universities had the highest pretest mean scores at Time 1 on the WGCTA subscales, and total score when compared with other students. Analysis of the data also revealed that students who had taken a majority of liberal arts electives showed greater ability on the WGCTA assumptions subscale at Time 1 when compared with students who had taken a majority of science electives (Sandor et al., 1998).

Sandor et al. (1998) concluded small group work was effective in developing CT skills of students. Students prepared in university settings versus junior colleges benefitted more from a scenario-based teaching strategy in a community health course. Educators must be cognizant of students' educational backgrounds and needs in order to design curriculum best suited to educate future nurses in various educational settings.

Nursing students need to be challenged to learn in ways which will increase critical thinking. Research has examined reflective learning as a means to improve critical thinking in nursing students. The purpose of a descriptive study by Platzer et al. (2000) was to test the use of group discussions to facilitate the premise that reflective learning practices will develop a higher level of critical thinking skills for nursing students. Mezirow's Transformative Learning Theory served as the framework for this descriptive study. According to Mezirow, transformational learning requires a process of critical reflection.

Study participants included 30 nursing students enrolled in a part-time Diploma Program in Professional Studies in Nursing program at a College of Higher Education in England. Two cohort groups of students were followed through the second year of the program. Four groups comprised of 6-10 students, and 1-2 facilitators participated in the reflective group practice sessions over the course of the 2 year study. Groups met every 2 weeks for a total of 15 meetings during the academic year. Facilitators for the groups provided an unstructured and non-directive format for the sessions and assumed a non-authoritarian role. Students established ground rules for participation in the sessions so that all felt safe and non-threatened during the participation (Platzer et al., 2000).

After completing the year of study, each of the 30 students participated in an in-depth qualitative interview about the experience in the reflective practice group. Semi structured interviews included questions about students' previous experiences with the entire program of study, and particular experiences with the reflective practice group.

Individual interviews and group sessions were audio-recorded and transcribed. Data were coded and categorized as themes emerged (Platzer et al., 2000).

Findings revealed several factors facilitated learning. Students found the supportive, nonjudgmental environment of the group sessions beneficial. Receiving feedback and constructive criticism was also viewed as a factor which facilitated learning and allowed students to validate practice and feel less isolated in dealing with complex issues in the practice setting. Being challenged to examine situations in depth also facilitated learning. Having others' experiences to draw from, and being exposed to a range of opinions and perspectives, resulted in students being more reflective. Participants reported feeling more understanding of other learners. Students appeared more confident and more empowered to make decisions following participation in the reflective practice groups. Participants began to show a shift in allegiance from the organization to the client. Barriers to reflective learning included difficulty negotiating and stalling, back sliding, and self-deception (Platzer et al., 2000).

Platzer et al. (2000) concluded that while the true potential of transformational learning was not fully recognized by the participants, reflective practice groups do have the potential to facilitate transformational learning. Nursing education must incorporate teaching strategies, such as reflective practice groups, as a means of fostering critical thinking and professionalism.

Meaningful learning involves the assimilation of new concepts with previous experience. This type of learning is necessary for the development of problem solving and critical thinking. Concept mapping can facilitate meaningful learning. Wheeler and

Collins (2003) examined the effectiveness of concept mapping as a teaching strategy to help students develop critical thinking skills. Ausubel's (1968) Assimilation Learning Theory served as the framework. Ausubel suggested meaningful learning can occur if the learner can assimilate new concepts and knowledge into an existing knowledge base (Wheeler & Collins, 2003).

Wheeler and Collins (2003) used a quasi-experimental, pretest posttest design with a control group to determine whether concept mapping was effective in improving critical thinking skills in nursing students. Participants for the study ($n = 76$) were recruited from sophomore students enrolled in a baccalaureate nursing program at the University of North Carolina School of Nursing. Participants were randomly assigned to an experimental group ($n = 44$) or a control group ($n = 32$) during the junior year of study. Concept mapping was introduced to all students enrolled in the Adult Health course and one third of students enrolled in the Pediatric Nursing course. The experimental group consisted of students using concept mapping as part of clinical. The control group consisted of students in the remaining two thirds of the pediatric course, and students in maternity and psychiatric nursing courses. Students in the control group used traditional nursing care plans to prepare for clinical. Participants' ages ranged from 20-44 years old, with 63% of the sample under 22 years of age. The sample was predominantly female (95%). All participants had completed enough courses to begin the junior year in the nursing program.

A demographic questionnaire developed by the researchers was used to collect data on age, gender, level of education, and previous use of concept mapping. The California

Critical Thinking Skills Test (CCTST) was used to measure critical thinking skills for both the control and experimental groups. The CCTST provides six scores: an overall score and five subscale scores (analysis, evaluation, inference, deductive reasoning, and inductive reasoning). Internal consistencies computed for the CCTST using the Kuder-Richardson 20 were determined acceptable for an instrument of this type (Form A = .70 and Form B = .71). Face validity for the CCTST has been established by test takers and by assessing test questions. Construct validity is supported by inclusion of test items that reflect the definition of critical thinking by the Delphi study. Construct validity has also been confirmed by pretest and posttest experiments which showed improved critical thinking skills in individuals who completed a critical thinking course as compared to individuals who had never taken a CT course. Participants completed the pretest (CCTST Form A) at the beginning of the fall semester, and completed the posttest (CCTST Form B) at the end of the fall semester (Wheeler & Collins, 2003).

Wheeler and Collins (2003) found no significant differences in the pretest scores on the CCTST between the two groups. Overall CCTST mean scores for the experimental group improved significantly from pretest (mean = 16.93, SD = 4.37) to posttest (mean = 18.02, SD = 3.94). Overall CCTST mean scores for the control group improved only slightly from pretest (mean = 17.34, SD = 3.66) to posttest (mean = 17.56, SD = 4.26). The experimental group scores improved significantly on the analysis and evaluation subscales, while the control group scores improved only on the evaluation subscale. Neither group showed a significant change on the deductive and inductive reasoning subscales. The control group showed a significant decline on the inference

subscale from pretest to posttest. Both traditional care plans and concept mapping were effective in improving CT skills of students. Students who used concept mapping showed greater improvement in both overall CCTST scores and on the analysis and evaluation subscales from pretest to posttest than individuals who used traditional care plans, suggesting that concept mapping was more effective in promoting CT and meaningful learning (Wheeler & Collins, 2003).

Wheeler and Collins (2003) concluded traditional teaching methods, such as nursing care plans, do not provide meaningful learning. Concept mapping is an effective means of promoting meaningful learning, and improving CT skills in nursing students. Concept mapping should be considered an effective strategy for nurse educators to use to both develop and measure critical thinking skills.

Nurse educators need to address critical thinking skills and must utilize teaching strategies which will promote critical thinking skills. A study conducted by Khosravani et al. (2005) examined one such teaching strategy. The purpose of this quantitative study was to determine if group dynamics sessions were an effective teaching strategy to improve critical thinking abilities of students participating in the sessions.

Khosravani et al. (2005) utilized a quasi-experimental design to determine the effects of holding group-dynamics sessions on critical thinking skills of nursing student enrolled in a community health course. The convenience sample consisted of 60 randomly selected senior baccalaureate nursing students enrolled at Shaheed Beheshti Faculty of Nursing and Midwifery. The inclusion criteria was student completion of clinical training in health clinics affiliated with the university. The majority of the

students were single females with an average age of 23 who had no previous experience with group work. Students were randomly divided into two equal groups. Each group was further divided into four subgroups, and each subgroup consisted of seven or eight students. The experimental subgroups, two seven-member groups and two eight-member groups, participated in 8-10 group dynamic sessions. Group dynamics sessions were 1 to 1.5 hours in length. Sessions for experimental groups were held 2 days a week over a period of 25 days.

Selected topics relating to concepts of family health and the role of the community health nurse were discussed during group dynamics sessions. Students participating in the group dynamic sessions discussed concepts related to family health. The role of the community health nurse was discussed. Potential problems encountered in this role, as well as potential solutions to problems were addressed. The control subgroups completed routine training which consisted of clinical conferences and home visits (Khosravani et al., 2005).

Data collection included a demographic questionnaire and a questionnaire consisting of 12 questions, and four clinical report forms used to evaluate critical thinking skills. Clinical report forms were designed using the nursing process steps of assessment, diagnosis, planning, and evaluation. Validity of the questionnaire was established by content validity, and internal reliability was measured by internal consistency ($r=.99$). Two weeks after completion of the last session, data were collected from both the experimental and control groups (Khosravani et al., 2005).

Findings revealed the majority of the students were single females, with an average age of 23, who had no previous experience with group work. No statistically significant differences existed with respect to the variables of age, average score of the previous term, and units passed between the two groups. Results of the study revealed statistically significant differences in critical thinking abilities between the two groups in all areas examined except for seeking information. Students who participated in group dynamics sessions had significantly higher critical thinking subscale scores in the areas of diagnosis, clinical reasoning, clinical judgment, prediction and creativity. Total scores of critical thinking were also significantly higher for students who participated in group dynamic sessions (Khosravani et al., 2005).

As evidenced by the finding of this study, Khosravani et al. (2005) concluded group dynamics sessions were an effective means of enhancing critical thinking abilities of baccalaureate nursing students. Nurse educators must provide students with opportunities for deeper thought to promote learning and enhance critical thinking skills.

Tiwari et al. (2006) believed problem-based-learning (PBL) promotes critical thinking. The use of PBL as a teaching method in nursing education may be more effective than lecturing in preparing students to become critical thinkers. The purpose of this randomized, controlled trial was to compare critical thinking (CT) development over a period of 3 years based on method of study, problem-based or lecture. Tiwari et al. (2006) focused on the internal motivation to value and use critical thinking. Lewin's Change Theory served as the framework. Lewin asserted that if a disposition toward critical thinking is valued, it will serve to motivate an individual to master CT skills.

The convenience sample ($n = 79$) consisted of Year 1 undergraduate students enrolled in a 4-year nursing program at a university in Hong Kong. All study participants were born and raised in Hong Kong. The average age of participants was 20.16 years. None of the students had prior experience with PBL, while all had previous experience with lecture. Students were randomly assigned to a course delivered by PBL ($n = 40$) or a parallel course delivered by lecturing ($n = 39$) over 1 academic year. Students in the PBL group participated in a 2-semester course in nursing therapeutics, with PBL used as the educational approach. Participants assigned to the PBL group were divided into tutorial groups of 10 students and 1 PBL tutor who serve as facilitator. PBL tutorial groups met 3 to 6 hours per week for a period of 28 weeks over 2 semesters. The tutor developed case scenarios and presented cases to students, facilitated reflective group work, and assisted students to refine the approach to PBL. Students were responsible for analysis of case scenarios, generating hypotheses, researching learning objectives, synthesizing explanations, and applying newly acquired knowledge to the problem (Tiwari et al., 2006).

Students assigned to the lecture group also participated in a 2-semester nursing therapeutics course with lecturing as the educational approach. Lectures lasted between 2 and 3 hours, and were delivered 2 to 3 times per week for 28 weeks over 2 semesters. Lectures consisted of instructors verbally presenting course content to students, and students participated passively. Students in this group were provided with lecture notes. For the 3 years following the intervention, participants had the same educational

experience in the nursing program. No further PBL was utilized in the nursing program in the students' remaining 3 years of study (Tiwari et al., 2006).

The California Critical thinking Dispositions Inventory (CCTDI) was used to measure students' critical thinking. The CCTDI is a 75-item Likert scale tool with the following seven subscales: truthseeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and cognitive maturity (Tiwari et al., 2006, p. 548). The CCTDI measures positive, ambivalent, or negative dispositions toward critical thinking as evidenced by overall scores and scores each of the seven subscales. Scores on each of the subscales range from 10 to 60. Scores greater than or equal to 40 indicate positive disposition. Scores of 31-39 indicate ambivalence and score less than or equal to 30 indicate negative disposition. Overall CCTDI scores are derived from the subscores. A score greater than or equal to 280 indicates positive disposition. A score less than or equal to 210 indicates a negative disposition, and a score of 211-279 indicates ambivalence. Alpha reliability for the CCTDI is 0.91 with a range of 0.71 to 0.80 for the subscales. The CCTDI was administered to participants prior to being assigned to either PBL or lecture group students. At the end of the second semester, following completion of PBL or lecture experience, the CCTDI was administered (second time point) and repeated at 1 year (third time point) and 2 year (fourth time point). Students also participated in individual semi-structured interviews at the second, third and fourth time points. Interviews allowed students' to share perceptions of the educational methods and feelings regarding the experiences (Tiwari et al., 2006, p. 549).

Findings revealed there were no significant differences in overall CCTDI and subscale scores for the PBL group and the lecture group at pretest (first time point). At each subsequent time point during the study overall CCTDI scores of the PBL revealed ambivalence to positive dispositions toward critical thinking, while the lecture group remained ambivalently disposed. Two-sample *t*-tests revealed differences between the two groups of students from the first to second time points. Scores were significantly greater for PBL students when compared to lecture students in overall CCTDI, and subscale scores of truthseeking, analyticity and self-confidence. Scores were again significantly higher from the first to third time point in overall CCTDI, truthseeking, and analyticity subscale scores. PBL students continued to have significantly greater differences from the first to fourth time point in subscale scores of truthseeking and systematicity (Tiwari et al., 2006).

Interview data revealed differences in students' perceptions of learning experiences. PBL students reported having actively participated in the learning process, while lecture students reported having been passive learners. The learning experience had been enjoyable and inspiring for PBL students. Lecture students were negative regarding about the learning experience. PBL students believed the tutorial groups encouraged deeper thinking. Lecture students did not believe thinking was encouraged in lectures (Tiwari et al., 2006).

Tiwari et al. (2006) concluded PBL was more effective in enhancing CT skills than lecturing. PBL encourages self-motivation. Students are more likely to attain higher levels of CT when motivated to learn. Teaching strategies such as PBL which engage

students can result in not only short term improvement in CT but an improvement in CT skills over time as well.

Clinical post-conferences allow nursing students to share knowledge, and provide opportunities for group discussion and critical thinking. A study conducted by Hsu (2007) explored nurse educators' perceptions regarding clinical post-conferences as a means of better preparing student nurses to think critically. In addition, Hsu examined interaction characteristics between students and faculty in clinical post-conferences. Mezirow's Transformative Learning Theory served as the framework. Critical reflection is considered essential for transformative learning to occur.

The convenience sample was recruited from a 2 year nursing college in Tao Yuan, Taiwan. The sample consisted of 10 female nurse educators with masters' degrees. The nurse educators had an average age of 32 years, and average teaching experience of 5 years, with two educators having 10-11 years teaching experience. Five educators attended domestic programs, four in the US and one in Australia. Nursing students (n=50) who had previously completed an LPN program also participated. Student participants were unmarried and had an average age of 19 years (Hsu, 2007).

Researchers used participant observation, taped transcripts, and field notes (in which procedures, body language and facial expressions were recorded). A total of 20 clinical conferences, two conferences per educator were observed. Clinical conferences on average lasted for approximately 1 hour. Transcripts were coded by one researcher and one trained observer, and data were confirmed with an expert in clinical teaching. Inter-rater reliability was established at 85-93% (Hsu, 2007).

Seven of the 10 educators believed discussions were vital to clinical post-conferences. Student participation, discussion leadership, different teaching methods, teacher support, and cohesion were also identified. Educators recognized that ward characteristics, learning goals, and student needs should be considered when designing and evaluating conferences. Hsu found educators tended to emphasize discussion of clinical experiences most often. Questioning was used most often by educators. Ninety percent of the time low level questioning was used, that invokes low order thinking. Only three of the educators used high level questioning to lead discussions in post conferences (6.8%). In addition, only three educators made use of teaching methods such as role playing, experience sharing, and assessment discussions (5.7%). Task orientation appeared most often (77.3%). Due to cultural factors, educators rarely expressed affective behaviors such as smiles, praise, support or friendliness to students. Teacher support was found to be the least occurring element (1.1%) (Hsu, 2007).

Hsu (2007) concluded that reflection, and use of high order thinking, promote critical thinking and meaningful learning in clinical post-conferences. Instructors need to support students as this promotes problem solving. Nurse educators that are task oriented will not promote critical thinking.

Nurse educators must use teaching strategies which will encourage students to become self-directed learners, and develop skills such as critical thinking, problem solving, and teamwork skills. Problem-based learning (PBL) is one such teaching strategy. The purpose of this quasi-experimental study (Yuan et al., 2008) was to examine the effect of PBL on critical thinking skills.

The participants were recruited from a university in Shanghai, China. The 46 participants were in the second year of study, and registered in an Introduction to Nursing course. Ages of students ranged from 18-22 years, with a mean age of 19.59 years. The sample included 35 females (76.09%) and 11 males (23.91%). Researchers used a two-group pretest-posttest design. Students were randomly assigned to an experimental group (N=23) or a control group (N=23). PBL approach was used for the experimental group, while a lecture approach was used for the control group. The experimental group was divided into two smaller groups of 11 and 12 students, with one tutor per group. Students worked in small groups using five learning packages. Students met 2 hours per week for 18 weeks. Students assigned to the control group passively received information from instructors during lectures. Students in the control group had limited participation. Lectures were given 2 hours per week for 18 weeks (Yuan et al., 2008).

The PBL approach involved the following steps:

1. Group clarification of given scenarios and definition of problems.
2. Brainstorming which allowed students to apply previous knowledge and ideas, and to explain and solve problems related to given scenarios.
3. Self-directed learning allowed students to work on identified research topics and prepare critical thinking questions for group discussion.
4. Group discussion provided students opportunities to share what had been learned, discuss CT questions, and formulate possible explanations for scenarios.
5. Care planning to develop care plans relevant to given scenarios.
6. Evaluation and reflection which allowed students to reflect on what was

learned and provided time for self-evaluation and peer evaluation (Yuan et al., 2008, p. 71).

During the small group sessions the tutor encouraged open discussion among students and the use of higher order thinking. The same course content was provided to both the control and experimental groups (Yuan et al., 2008, p. 71).

The California Critical Thinking Skills Test Form A (CCTST-A) was used to measure CT skills of participants. The CCTST was administered to students at the beginning of the semester and again at the end of the semester following completion of the nursing course. The CCTST is a 34-item multiple choice test which includes five subscale scores: analysis, evaluation, inference, deductive reasoning, and inductive reasoning. In this study reliability of the CCTST-A established with KR-20 was 0.80 for the total scale and 0.60, 0.70, 0.69, 0.78, and 0.61 for the subscales of analysis, evaluation, inference, deduction, and induction respectively. At the time of posttest PBL students were asked to provide written comments on advantages and disadvantages of PBL ($P = 0.429$) (Yuan et al., 2008).

Findings with respect to CT skills revealed overall mean scores of 19.72 ($SD = 2.76$) at the beginning of the semester, and 20.83 ($SD = 3.32$) at the end of the semester. Higher mean scores were seen on the inference and deduction subscales, and lower scores were seen on the induction subscale. Yuan et al. (2008) suggested this may be because the process of induction may be more difficult, and require expert knowledge. It involves deriving one idea from another, rather than involving the process of reasoning from general to specific as is necessary in the process of deduction. Yuan et al. (2008) found

no significant differences in CT skills between the two groups at pretest ($p = 0.429$). Students who participated in the PBL group showed greater improvement on the overall CCTST-A, and on the analysis and induction subscales when compared with the lecture group. The majority of students (91.3%) found PBL allowed for sharing of opinions with others, analysis of situations in various ways, and creative problem solving. Nineteen students (82.61%) reported PBL encouraged different ways of thinking (Yuan et al., 2008).

Yuan et al. (2008) concluded PBL stimulates and enhances learning. PBL enhances critical thinking skills in nursing education. Nurse educators should consider PBL an effective strategy for promoting critical thinking among students and producing nurses prepared to use CT skills to provide sound clinical judgment.

Comparison of Students on Critical Thinking

Nurse educators must develop curricula and teaching strategies which promote the development of critical thinking skills. Revision of nursing curriculum may assist educators to better prepare students to succeed as nursing professionals. A longitudinal study by Beckie, Lowry & Barnett (2001) examined critical thinking skills in baccalaureate nursing students before and after a curriculum revision. The authors sought to determine differences in CT skills of baccalaureate nursing students who completed a former nursing curriculum, compared with students who completed a revised curriculum designed to promote critical thinking. The authors examined differences in student's CT skills from entry into the junior year, at midpoint, and at exit from the program. The authors utilized a pretest-posttest, nonequivalent control group design.

The convenience sample of 183 baccalaureate nursing students was drawn from a west central Florida University College of Nursing, divided into three groups of students. The majority of the participants were single, Caucasian females with mean ages of 24.6, 25.8, and 26.4 years respectively among the three cohorts. Cohort 1 (n=55) was the baseline class before curriculum revisions, while cohort 2 (n=55) and cohort 3 (n=73) were the first two classes who experienced the curriculum revision (Beckie et al., 2001).

Both a demographic data form and the CCTST were used to collect data. The California Critical Thinking Skills Test (CCTST), which targets the five critical thinking skills of analysis, evaluation, inference, deductive reasoning, and inductive reasoning was administered to the three cohort groups of students at the beginning of the junior year, at the beginning of the senior year, and exit testing was completed after all baccalaureate course work had been completed. Cronbach's alpha internal consistency reliabilities on the CCTST for each test and each cohort ranged from 0.55 to 0.83 (Beckie et al., 2001).

Scores of all three cohorts were significantly different on the total CCTST score, the analysis subscale, the inductive reasoning subscale, the deductive reasoning subscale, the inference subscale, and the evaluation subscale which suggests increased critical thinking for all cohorts. Cohort 2 showed statistically significantly higher scores compared with cohort 1 on the total CCTST score, suggesting that improved critical thinking skills was a result of curriculum revision. Cohort 3, the second class to experience curriculum revision showed no significant improvement in CT scores. The authors attributed this to the fact the students in this group tended to have little motivation to complete the test accurately. Another explanation offered for this finding

was variations that may exist between classes, with each class having a unique personality that may have negatively affected the motivation of Cohort 3 (Beckie et al., 2001). With respect to CT skills as measured by the CCTST over time, cohort 2 scores improved significantly, cohort 1 scores remained unchanged, and cohort 3 scores decreased each time the test was administered.

Beckie et al. (2001) concluded the curriculum revision did improve critical thinking skills for some of the students who experienced the curriculum revision. The authors suggested the CCTST should be supplemented with other evaluation methods to fully assess student's CT skills.

Nursing education has traditionally focused on rote memorization, and has not allowed students opportunities to think creatively and critically. Shin, Lee, Ha, and Kim (2006) believed the development of critical thinking skills and clinical decision-making abilities has become an important aspect of nursing education, and appropriate teaching strategies should only be designed after evaluating students' critical thinking abilities. The purpose of this longitudinal study was to measure critical thinking dispositions of nursing students in the 1st to 4th years of a baccalaureate nursing program. The researchers sought to determine if differences in critical thinking dispositions (CTD) existed among, first, second, third and fourth year nursing students.

The convenience sample included 60 students attending a baccalaureate nursing program at a university in Korea. Of the original sample of 60 students, 32 students participated through the 4 year duration of the study. Students who withdrew from the

study, took a leave of absence from school, or gave incomplete answers were excluded from the study (Shin et al., 2006).

The California Critical Thinking Dispositions Inventory (CCTDI) questionnaire was used to measure critical thinking dispositions of participants. The CCTDI questionnaire has 75 items with forced-choice Likert responses ranging from “strongly agree” to “strongly disagree.” The instrument also contains seven subscales which reflect aspects of critical thinking dispositions: open-mindedness, inquisitiveness, truth seeking, systematicity, analyticity, self-confidence and maturity. Internal reliability for the tool has been established at 0.91. Data were collected by administering the CCTDI during scheduled classes every March from 1999 to 2002. ANOVA was used to assess changes of CTD over the 4 school years (Shin et al., 2006).

Findings revealed statistically significant improvement in critical thinking skills as students progressed through each subsequent academic year of the nursing program. In addition, the subscales of open-mindedness, self-confidence, and maturity showed statistically significant differences by academic year. No significant differences were noted in the subscales of truth-seeking, inquisitiveness, analyticity, and systematicity. Although there was improvement in the total CCTDI scores, as well as many of the subscales over the course of the 4 year program, the findings indicated the current curriculum for this nursing program offered little to improve the development of students’ critical thinking abilities. The authors concluded that the current curriculum does not impact CT scores across the program (Shin et al., 2006).

Shin et al. (2006) recommended nurse educators in this setting, and perhaps other settings in Korea, need to examine teaching strategies which will foster critical thinking skills. Instruments such as the California Critical Thinking Dispositions Inventory should be utilized to determine the effectiveness of teaching strategies which will promote critical thinking among nursing students.

One goal of nursing education is to develop the critical thinking skills of students. Educators are concerned with students' critical thinking dispositions and learning styles because this affects teaching methods. A descriptive, comparative study by Suliman (2006) examined critical thinking dispositions and learning styles of conventional students (Stream I), and accelerated students (Stream II), to determine if level of cognitive maturity influences CT abilities and learning styles.

The study was conducted at the College of Nursing and Allied Medical Sciences in Saudi Arabia. The college offers both a conventional (Stream I) 4-year program to high school graduates, and a 2-year accelerated program to university graduates with a degree in physics, math, chemistry or biology. The convenience sample included 130 participants: Stream I (N=80), and Stream II (N=50). Analysis of demographic data revealed the majority of Stream II students were biology graduates (60%), chemistry graduates (30%), with the remainder physics (6%), and math (4%) graduates. The theoretical framework was critical thinking dispositions and learning styles (Suliman, 2006).

Data were collected from CNAMS students in 2004 using three instruments: a demographic questionnaire developed by the researcher, the Learning Styles Inventory

(LSI), and the California Critical Thinking Dispositions Inventory (CCTDI). The LSI was used to measure individual learning styles of the students. The LSI measures four ways of learning: concrete experience (CE) - feeling, reflective observation (RO) - watching, abstract conceptualization (AC) - thinking, and active experimentation (AE) - doing. Learning styles of students are a combination of two variables which are based on how tasks are approached (RO-watching or AE-doing) and emotional response to experiences (AC-thinking or CE-feeling). Preference for how a task is approached and the emotional response to the task determines preferred learning style. The LSI measures four distinct learning styles: diverging (CE/RO), accommodating (CE/AC), converging (AC/AE), and assimilating (AC/RO). Cronbach alpha reliability for the LSI was 0.78 (Suliman, 2006).

The CCTDI was used to measure students' dispositions toward critical thinking. The CCTDI yields a total score for the instrument which gives equal weight to each of the following seven subscales: truth seeking, inquisitiveness, open-mindedness, analyticity, systematicity, self-confidence, and maturity. Each subscale of the CCTDI contains 9-12 statements. Participants respond to the 75 statements of the CCTDI on a 6-point Likert-type scale, based on agreement with the disposition statement. Each subscale score is 9-72 with a possible range in overall score of 75-450. Cutoff score for the CCTDI is 280 and target score is 350. A student is considered weak in a disposition if the score is below 40 and strong if the score is above 50. Cronbach alpha reliability for the CCTDI overall was 0.85, and 0.74-0.86 for the subscales (Suliman, 2006., p. 76).

Previously the majority of Stream II students (62%) scored between 80-90%. Only 18% scored above 90%, and the remaining 20% scored between 70 and 80%. The majority of Stream I students (58.2%) scored more than 90% on the Saudi High School Examination, 40.5% of Stream I students scored 80-90%, with the remaining 1.3% scoring between 70-80% (Suliman, 2006, p. 76). With respect to LS and the four subscales of the LSI (CE, RO, AC, and AE), both Stream I and Stream II students preferred to learn through AE, and least preferred the use of CE for learning. Combination mean scores for AE-RO and AC-CE for both groups of students, and for each Stream, revealed both Stream I and Stream II students preferred active experimentation over reflection and abstractness over concreteness. Stream II students were significantly higher critical thinkers ($p=0.000$), inquisitive ($p=0.000$), and self-confident ($p=0.002$). The predominant learning styles of Stream I and Stream II were diverger and converger respectively, with no difference in relation the learning abilities, namely concrete experience ($p=0.017$). Stream I students' predominant learning abilities were CE and RO. Predominant learning abilities among Stream II students were AC and AE (Suliman, 2006).

With respect to critical thinking, overall sample mean scores fell below the cutoff point of 280. Total CCTDI mean scores for Stream II exceeded the cutoff point of 280, while mean scores of Stream I fell below the cutoff point.

Three predominant CTD were seen among Stream I students: analyticity (mean = 44.01), self-confidence (mean = 41.96), and inquisitiveness (mean = 41.58). Four dispositions were predominant among Stream II students: inquisitiveness (mean

45.86), self-confidence (mean = 45.51), analyticity (mean = 45.25), and Systematicity (mean 40.25). Univariate F-tests showed differences between Stream I and Stream II with respect to self confidence ($F = 10.400$, $p = 0.002$) and inquisitiveness ($F = 13.692$, $p = 0.000$) in favor of Stream II (Suliman, 2006, p. 77).

Suliman (2006) noted several findings regarding the relationship between learning abilities and critical thinking dispositions. Students who preferred CE tended to have a positive disposition toward analyticity and a negative disposition toward inquisitiveness. RO was significantly negatively correlated with truth seeking and systematicity. A preference to learn by AC was significantly positively correlated with truth seeking, analyticity, systematicity, self-confidence, and maturity. Suliman (2006) concluded Stream II students were convergers and were best at inquisitiveness and self-confidence. Stream II students relied upon thinking and doing for the development of convergent CT. Stream I students relied on watching and feeling for the development of divergent CT. Stream I students were divergers and possessed inadequate CT skills. Overall the participants LS were balanced (Suliman, 2006).

Suliman (2006) recommended that nurse educators strive to identify ways in which students learn best. Possessing an awareness of students' critical thinking dispositions and learning styles can allow educators to develop effective teaching strategies that facilitate learning. The author concluded that effective use of teaching strategies which account for students' preferred learning environment will foster CTD of students and ultimately improve CT skills.

Critical care nurses are expected to process large amounts of information and require critical thinking skills in order to make appropriate clinical decisions. Rogal and Young (2008) conducted a pilot study to determine if critical thinking skills of nurses enrolled in a postgraduate critical care course improved over time. The authors utilized a pretest posttest design.

Participants consisted of 31 registered nurses enrolled in the Sir Charles Gairdner Hospital Graduate Certificate of Critical Care postgraduate nursing course. Participants included 15 nurses enrolled in the 2005 critical care course and 16 nurses enrolled in the 2006 critical care course. Results of the study revealed the sample was predominantly female (83.9%). Participants had an average of 5.5 years general nursing experience, and an average of 2.3 years of critical care nursing experience. One participant resigned before the study's completion. The 12-month full time course took place in Perth, Western Australia. The course was offered to nurses seeking specialization in critical care nursing. The course consisted of theory classes and clinical rotations in both intensive and coronary care units. Students participated in classes 1 day per week and clinical 4 days per week on average (Rogal & Young, 2008).

The California Critical Thinking Skills Test (CCTST) was used to measure critical thinking skills of students at the beginning of the 12 month course, and again at the end of the course. The CCTST is a 34 question multiple choice test which includes the following five subscales: analysis, evaluation, inference, inductive reasoning, and deductive reasoning. The total score on the CCTST can range from 0-34. The CCTST is a reliable instrument with an internal consistency demonstrated by Kuder-Richardson 20

ranging from .78 to .84. Content validity for the CCTST was previously established by a panel of 46 national experts who participated in the Delphi project of the American Philosophical Association (Rogal & Young, 2008). Descriptive and inferential statistics (paired t-tests) were used to analyze data.

With respect to critical thinking skills mean scores for the CCTST were 18.5 at pretest and 19.7 at posttest. Sixteen of the participants showed improved critical thinking skills from beginning to end of the 12 month program as evidenced by improved CCTST scores. Seven participants had decreased scores, and five participants showed no change in CCTST scores. For students whose total CCTST scores improved over the course, a statistically significant difference was seen between pretest and posttest scores. Scores on all five subscales of the CCTST had also improved. All pretest and posttest mean scores were above the established norms for the CCTST (Rogal & Young, 2008).

The majority (58%) of participants showed improvement in critical thinking skills following completion of the critical care course. Not all of the participants showed improvement in critical thinking skills. There were lower scores at posttest for 22.5% of the participants. The authors suggested this decrease in critical thinking scores may be attributed in part to the timing of the test, which was offered at the end of the course, and student fatigue and decreased motivation may have been factors (Rogal & Young, 2008).

Although only slight improvement in critical thinking skills was seen, the authors concluded that the postgraduate course did improve critical thinking skills. Rogal and Young (2008) suggested nurse educators develop curricula which foster the development of critical thinking skills of students. Use of valid and reliable instruments to measure

critical thinking skills among students can provide a means of evaluating whether or not courses are effective in developing critical thinking skills.

Faculty Critical Thinking Skills

If nurse educators are to foster critical thinking (CT) in nursing students, educators must possess critical thinking skills. Relationships have been established between the CT skills of educators and the level of CT achieved by students. Zygmunt and Schaefer (2006) conducted a descriptive, correlational study to determine the critical thinking skills of nurse educators, and examine the relationship between epistemological position and critical thinking skills.

A randomized sample of 300 full-time nurse educators, from 60 schools of nursing, yielded a convenience sample of 37 full-time nurse educators. Participants had an average age of 50.66 years, and were predominantly female (75%). The majority of participants (78.4%) had no formal or informal education in CT, 18.9% reported having attended an educational program on CT. Most faculty (81.1%) were responsible for both classroom and clinical instruction. Nurse educators teaching exclusively in the classroom accounted for 2.7% of the sample. Study participants reported teaching in three types of programs: diploma/associates (32.4%), baccalaureate (43.2%), and master's (21.6). Participants reported a mean of 14.47 years teaching experience, with a mean of 12 years experience teaching at the undergraduate level, and 2 years experience in graduate education. Educators who had previously completed the CCTST or the LEP, or who had administered either instrument were excluded from participation in the study (Zygmunt & Schaefer, 2006).

Instruments used to collect data included a demographic questionnaire developed by the investigators, the California Critical Thinking Skills Test (CCTST), and the Learning Environment Preference (LEP). The CCTST, a 34-item multiple choice test was used to measure CT skills of participants. The CCTST reliability coefficient for this study was 0.86 (Zygmunt & Shaefer, 2006, p. 261). The CCTST examines five areas related to CT: analysis, inference, evaluation, and inductive and deductive reasoning. Potential overall score for the CCTST ranges from 0 to 34. CCTST reliability

The LEP assesses individual learning environment preference and was used to provide researchers with an indication of educators' epistemological position. The LEP is a 65-item objective, task-recognition instrument. Participants respond to statements on the LEP using a four-point Likert scale with responses ranging from 'not significant at all' to 'very significant' which provide an indication of participants' preferred leaning environment. The LEP addresses five areas with respect to preference in learning environment: course content and view of learning, the role of instructor, role of students and peers, classroom atmosphere and activities, and course evaluation. Position 5 of the LEP is indicative of CT. Cronbach's alpha for each domain of the LEP ranged from 0.63 to 0.84. Overall reliability of the LEP for this study was 0.79 (Zygmunt & Shaefer, 2006, p. 262).

The investigators conducted telephone interviews with 12 educators who provided a clinical or classroom example of a student's use of CT. Audio-taped telephone interview lasted approximately 60 minutes. Narrative data were analyzed to determine educators' understanding of CT and to identify examples related to analysis, inference, and evaluation (Zygmunt & Schaefer, 2006).

With respect to critical thinking, the CCTST scores revealed variability of CT ability among the educators. CCTST scores for 70% of the educators were greater than 19. When compared with a norm group of baccalaureate students educators possessed higher levels of CT skills. Levels of CT were similar when compared with a norm group of students in a graduate program. The authors suggested the similarity in level of CT skills of educators and graduate students may have been the result of a biased sample. Significant positive correlations were seen between the total CCTST scores and all of the subscales of the CCTST with the exception of analysis. Narrative data revealed educators were skilled in analysis despite the lack of positive correlation (Zygmunt & Schaefer, 2006).

While results of the CCTST indicated that many of the educators could think critically, analysis of LEP data did not find CT skills with high scores among the faculty. Analysis of data from the LEP revealed no educator viewed knowledge as absolute or dualistic as indicated by Positions 1-3. No educator achieved Position 5 (contextual relativism) which is indicative of CT. The mean score for the entire sample was indicative of Position 4. This finding suggested most of the educators (78.4%) were at a developmental level to master CT. Educators who allowed students opportunities for reflection and high order thinking were more likely to be critical thinkers themselves (Zygmunt & Schaefer, 2006).

Narrative data from the 12 telephone interviews revealed all of the educators were able to provide appropriate examples of the three core critical thinking skills of analysis, inference, and evaluation. Educators were able to recognize when students were using higher order thinking associated with CT. Nearly all of the examples provided were of

students using CT who were in the clinical setting, with only three classroom examples provided. The multitude of examples relating to CT in the clinical area, and the results of the LEP, suggested educators are more skilled at fostering CT in the clinical setting, but do not utilize teaching strategies to foster CT in the classroom setting. (Zygmunt & Schaefer, 2006).

Zygmunt and Schaefer (2006) concluded that educators do not possess the same level of CT skills. Learning is an active process, and students need to be engaged in order for learning to occur. If nursing students are to develop CT skills, nurse educators must possess CT skills and utilize active teaching methods which promote reflection which is necessary not only in the clinical setting but in the classroom setting as well.

Summary

The purpose of this study is to examine the use of PBL as a teaching method to enhance critical thinking skills of nursing students. Lewin's (1935) Force Field Theory is the framework. Lewin (1944, 1951) asserts human behavior is the results of a physical or psychological need or desire which motivates the individual to move toward an object or goal which they desire. Force field theory can be applied to nursing students in examining critical thinking. If a student values critical thinking or has a psychological need or desire to become a critical thinker they will pursue the goal of becoming a critical thinker.

Teaching Methods to Enhance CT.

Many of the studies reviewed examined specific teaching methods to enhance CT skills of nursing students. Sandor et al. (1998) investigated to the use of small group

seminars in a scenario-based community health course to foster critical thinking skills and found the teaching method effective in enhancing CT skills. The hypothesis that students would show improved scores on the WGCTA posttest when compared to the pretest was confirmed by the authors. The second hypothesis that students who had completed prerequisites in midsized, 4-year universities would have higher scores on the WGCTA than students coming from junior colleges, small or large 4-year universities was rejected as students from large 4-year universities had the highest scores at the time of posttest. The third hypothesis that students from liberal arts backgrounds versus students from science backgrounds would score higher on the WGCTA was rejected by the authors. The authors concluded educators must consider students' educational background and the way in which it can affect student ability with regard to critical thinking.

Platzer et al. (2000) investigated the use of small reflective practice groups in nursing education and found reflective practice groups facilitated the development of critical thinking skills. In addition, students experienced changes in behavior and attitude and an increased sense of professionalism. Khosravani et al. (2005) recognized similar findings when exploring the use of group dynamics to develop critical thinking skills in nursing students. The authors concluded educators must use teaching methods, such as group dynamics that will facilitate deeper, more reflective thinking. Wheeler & Collins (2003) investigated the use of concept mapping as a means of helping students develop critical thinking skills, and found students were stimulated to learn and showed an improvement in critical thinking skills after using concept maps. Hsu (2007) investigated

nurse educators' perceptions of clinical post-conferences, and examined the interactions between educators and students during post-conferences. Educators tended to use low level questions during clinical post-conferences. The author concluded clinical post-conferences must focus on more than cognitive learning, and include affective and behavioral learning as well. The author concluded nurse educators must ask questions that encourage high order thinking which enhance critical thinking in students.

Tiwari et al. (2006) examined the use of PBL as a teaching method to enhance critical thinking skills. Problem-based learning was found to be more effective in the development of critical thinking than traditional classroom lecture. The authors concluded learning environments in which students actively participate, such as PBL, are more conducive to the development of critical thinking skills than passive learning environments. Similar findings were recognized in a study by Yuan et al. (2008) which investigated the use of PBL in a nursing course at a university in China. When compared with students in a lecture setting, students who experienced PBL showed greater improvement in critical thinking skills. Students felt PBL motivated them to learn, allowed them the opportunity to share opinions with others, to collaborate with other group members and problem-solve more effectively.

Comparison of Students on CT.

Several studies investigating critical thinking skills of nursing students were reviewed. Beckie et al. (2001) investigated critical thinking skills of baccalaureate nursing students before and after curriculum revision and concluded curriculum revision did enhance critical thinking skills for some of the students who experienced the revised

curriculum. The authors suggested additional instruments be used to measure CT skills of nursing students. Shin et al. (2006) investigated the critical thinking dispositions of students in a baccalaureate nursing program in Korea. The authors found that as students progressed through each academic year of education, critical thinking dispositions increased. The authors concluded educators must possess an understanding of the nature of critical thinking, and utilize teaching methods to actively improve critical thinking skills of students.

Suliman (2006) investigated critical thinking and learning styles in conventional and accelerated nursing programs. The author found students in the accelerated program were significantly higher critical thinkers than students in the conventional program. Students in the conventional program were found to be divergent learners, who learn best by concrete experience and reflective observation, while students in the accelerated program were convergent learners who learn by thinking and doing. Despite differences between the two groups of students, overall students learning styles were found to be balanced. Suliman (2006) concluded nurse educators can facilitate the development of critical thinking by being aware of students' learning styles. An awareness of learning styles will allow the educator to use teaching methods which will promote effective learning.

Rogal and Young (2008) examined CT skills of postgraduate critical care nurses enrolled in a Certificate of Critical Care course were examined. The authors found the 12-month course did improve CT skills among most of the participants. Rogal and Young (2008) recognized the importance of nurse educators working toward the

development of a nursing curriculum which enhances CT skills, and allows graduates to use clinical judgment and to provide safe care.

Faculty CT Skills.

Several research studies were reviewed regarding various aspects of critical thinking in nursing students. Research with a focus on critical thinking skills of faculty and students were reviewed. Studies investigating teaching methods to enhance critical thinking skills of nursing students were also reviewed. Zygmunt and Shaefer (2006) investigated critical thinking skills of nurse educators and the relationship between epistemological position and critical thinking. The authors found that none of the educators had reached the epistemological position which indicates critical thinking, but all educators did possess some degree of CT skills. While not all educators possessed the same level of critical thinking skills, all of the nurse educators studied incorporated teaching methods to promote critical thinking. The authors concluded the ability of the nurse educators to engage in critical thinking may directly influence students' ability to learn critical thinking skills.

The review of the literature addresses critical thinking skills of nurse educators and students in various educational settings, and the teaching methods used to enhance critical thinking skills of students. Three of the studies reviewed (Rogal & Young, 2008; Tiwari et al., 2008; Zygmunt & Schaefer, 2006) were limited by small sample size. Shin et al. (2006), and Beckie et al. (2001) suggested the use of additional instruments to measure critical thinking which would take into consideration variables such as age, clinical experience and cultural factors. Further research on CT skills was suggested by

Sandor et al. (1998), Suliman (2006), Platzer et al. (2000), Khosravani et al. (2005), and Hsu (2007). Educators who are critical thinkers will be better equipped to enhance the CT skills of nursing students.

Chapter III

Methodology

Introduction

Nurse educators are challenged to utilize teaching strategies to enhance students' ability to think critically and develop clinical judgment. The National League for Nursing Accrediting Commission (NLNAC) (2008) and the Commission of Collegiate Nursing Education (CCNE) (2008) require nursing programs provide evidence of students competence of critical thinking for sound clinical judgment (Tiwari et al., 2006). This chapter includes: the purpose, research question, population, sample, setting, protection of human subjects, procedure, design, data collection, reliability and validity of instrumentation and data analysis.

Purpose

The purpose of this study is to determine if problem-based learning (PBL) is an effective teaching strategy to foster critical thinking in Baccalaureate nursing students when compared with traditional lecture. This is a modified replication of Tiwari et al.'s (2006) study. Lewin's Force Field theory is the study framework.

Research Question

Are there differences in critical thinking dispositions of two groups of junior level

nursing students, one group that has a problem-based learning (PBL) approach, and another group that has a traditional lecture approach?

Population, Sample, and Setting

The population for this study will include all junior baccalaureate nursing students attending Edinboro University in Northwestern Pennsylvania who are enrolled 2010-2011. The anticipated sample (N=100) includes junior nursing students who are enrolled in a Pediatric nursing course Fall 2010, and a Obstetrics nursing course Spring 2011 who agree to participation in the study. Exclusion criterion is previous experience with PBL. Upon agreeing to participate in the study, students will be alternately assigned to the PBL group or the lecture group.

Protection of Human Subjects

The study will be submitted to Ball State University Institutional Review Board (IRB) and Edinboro University Institutional Review Board for approval prior to initiation of the study. Ethical standards for research will be maintained. Participation is voluntary and there will be no consequences for refusal to participate. Written consent will be obtained prior to data collection. Data will remain anonymous. Participants may withdraw at any time. No risks have been identified with this study. The study will be of benefit to nurse educators providing information regarding the effectiveness of problem-based learning (PBL) as a teaching method to foster critical thinking skills in nursing students.

Procedure

After IRB approvals have been obtained, written correspondence will be mailed to the director of Edinboro University School of Nursing requesting permission for the researcher to meet with the Director of the School of Nursing and faculty teaching the Pediatric and Obstetrics Nursing courses to discuss the purpose and protocols of the study. After meeting with faculty the researcher will request students stay for 10 minutes after class at the end of the second week of the Pediatric course to describe the study and recruit study participants. Participation of all junior nursing students enrolled in the aforementioned courses will be sought during the first 2 weeks of the course.. The California Critical Thinking Disposition Inventory (CCTDI) will be administered to students at a time and location which is convenient to both research and students during the first month of the Pediatric course and the last 2 weeks of the Obstetrics course. As incentive to encourage student participation the researcher will hold a drawing for 10 - \$10 gift cards at the conclusion of the study which can be used on various locations on the Edinboro University campus. Students will be made aware of the incentive at the time participation is sought

Design

The study design is quasi-experimental. The purpose of quasi-experimental research is to examine differences between variables and is useful when a situation does not lend itself to true experimental design (Burns & Grove, 2005). This pre-test, post-test design is appropriate because it will allow the researcher to examine the effect of the PBL

intervention on students' critical thinking disposition over one year. It will also eliminate the need for randomization which may be impractical.

Data Collection

The California Critical Thinking Dispositions Inventory (CCTDI) will be administered to students as a pretest and a posttest. The location in which the CCTDI will be administered to participants will be agreed upon by nursing faculty and the researcher.

Instrumentation, reliability and validity

This study will use a single instrument. The California Critical Thinking Dispositions Inventory (CCTDI) will be used to obtain qualitative data. The CCTDI was developed by the American Philosophical Association Delphi Commission in 1992 to establish affective dispositions related to critical thinking. It is recommended for use in adult populations and students grade 10 and higher. The CCTDI can typically be administered in 20 minutes. It has been suggested the CCTDI is "a useful tool for measuring intellectual curiosity, as well as active engagement in one's surroundings" (Facione, Giancarlo, Facione & Gainen, 1995, p. 7).

The CCTDI consists of 75 statements to which respondents must indicate the extent of agreement or disagreement with statements provided on a 6-point Likert scale with 1=strongly disagree and 6=strongly agree. The instrument includes seven subscales: Truthseeking, open-mindedness, analyticity, systematicity, critical thinking self-

confidence, inquisitiveness, and maturity of judgment. Descriptions of the seven subscales are as follows:

Truthseeking.

Truthseeking is the habit of always desiring the best possible understanding of any given situation; it is following reasons and evidence where ever it may lead, even if it leads one to question cherished beliefs.

Open-mindedness.

Open-mindedness is the tendency to allow others to voice views with which one may not agree. Open-minded people act with tolerance toward the opinions of others, knowing that often we all hold beliefs which make sense only from our own perspectives. The opposite of open-mindedness is close-mindedness and intolerance for the ideas of others.

Analyticity.

Analyticity is the tendency to be alert to what happens next. This is the habit of striving to anticipate both the good and the bad potential consequences or outcomes of situations, choices, proposals, and plans. The opposite of analyticity is being heedless of consequences, not attending to what happens next when one makes choices or accepts ideas uncritically.

Systematicity.

Systematicity is the tendency or habit of striving to approach problems in a

disciplined, orderly, and systematic way. The habit of being disorganized is the opposite characteristic of systematicity. The person who is strong in systematicity may or may not actually know or use a given strategy or any particular pattern in problem solving, but they have the mental desire and tendency to approach questions and issues in an organized way.

Critical Thinking Self-confidence.

The tendency to trust the use of reason and reflective thinking to solve problems is reasoning self-confidence. This habit can apply to individuals or groups; as can the other dispositional characteristics measured by the CCTDI. The opposite is the tendency to be mistrustful of reason, to consistently devalue or be hostile to the use of careful reason and reflection as a means to solving problems or discovering what to do or what to believe.

Inquisitiveness.

Inquisitiveness is intellectual curiosity. It is the tendency to want to know things, even if they are not immediately or obviously useful at the moment. It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the applications of that new learning are not immediately apparent. The opposite of inquisitiveness is indifference.

Maturity of Judgment.

Cognitive maturity is the tendency to see problems as complex, rather than black and white. It is the habit of making a judgment in a timely way, not prematurely,

and not with undue delay. It is the tendency of standing firm in one's judgments when there is reason to do so, but changing one's mind when that is the appropriate thing to do. It is prudence in making, suspending, or revising a judgment. It is being aware that multiple solutions may be acceptable while appreciating the need to reach closure in certain circumstances even in the absence of complete knowledge. The opposite, cognitive immaturity, is characterized by being imprudent, black-and-white thinking, failing to come to closure in a timely way, stubbornly refusing to change one's mind when reasons and evidence would indicate one is mistaken. (Insight Assessment, 2010).

The CCTDI yields eight scores: seven subscale scores and a total score. The total score of the CCTDI gives equal weight to each of the seven subscales scores. The total overall score indicates whether an individual possesses a strong disposition, ambivalence or a negative disposition towards critical thinking. Subscale scores may range from 10-60 points. The higher an individual scores in each of the subscales, the greater the disposition to critical thinking with respect to that particular subscale. Total scores for the CCTDI, the sum of scores of the seven subscales, range from 70-420. A total CCTDI score of 350 is indicative of strong disposition towards critical thinking. A CCTDI score equal to or less than 210 is indicative of negative critical thinking disposition (Facione, Facione & Giancarlo, 2001). Furthermore the disposition towards critical thinking has been shown to be positively correlated with critical thinking skills (Facione & Facione, 1997). Independent researchers have evaluated the CCTDI for validity and reliability and have found the instrument both valid and reliable. The alpha reliability of the CCTDI is

.91. The Cronbach's alpha for this instrument ranges from .71 to .80 (Facione et al., 2001). Content and construct validity for the CCTDI have been established in previous studies (Facione & Facione, 1992; Giancarlo & Facione, 2001; Lederer, 2007; Yeh, 2002).

Data Analysis

The primary outcome measure in this study will be critical thinking disposition scores measured by the CCTDI. To determine factors which may affect CCTDI scores, to identify differences between the PBL and lecture groups, and to identify differences in student CCTDI scores at pretest and posttest t-tests will be performed. T-tests are used to assess whether the means between two groups are statistically significant. Bonferroni adjustment for multiple t-tests will be used in data analysis to control escalation in significance and reduce the risk of Type I error (Burns & Grove, 2005).

Summary

In this chapter the research design, methods and procedure have been described. The variables which will be examined include instructional method and critical thinking disposition. A quasi-experimental design will be used. The anticipated sample is 100 junior baccalaureate nursing students attending Edinboro University in Northwestern Pennsylvania. Quantitative data will be collected using the CCTDI. This study is a modified replication of a previous study conducted by Tiwari et al. (2006) and will attempt to both validate findings of the 2006 study and provide insight into the use of PBL as a teaching method to foster critical thinking in baccalaureate nursing students.

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Literature Review

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
Sandor et al. (1998)	Educational preparation of under-graduate nursing students needs to include community health settings to develop students' critical thinking abilities.	To explore scenarios, develop hypotheses, explore community Issues and seek Solutions that can be a valuable strategy to develop critical thinking skills in a community health course.	Concept: Critical thinking skills	Fifty four senior nursing students ages 20-55, with mean age of 29 years; primarily female (89%).	Comparative pretest-posttest	Demographic form collected: Age, gender, marital status, number of children, religion and description of educational setting for pre-nursing courses. WGCTA questionnaire consists of 80 items on two forms (A&B) that are considered equivalent, alternate forms. Subtest consists of 16 items with scores ranging from 0-16. The	<p>Hypothesis 1 There were significant differences from Time 1 to Time 2 on the subscale interpretation, $F(1,53) = .7779$, $p=.007$; the subscale Evaluation, $F(1,53) = 29.786$, $p=.0001$; and the critical thinking score, $F(1,53) = 10.23$, $p=.0024$.</p> <p>Hypothesis 2 Students who completed nursing pre-requisites in mid-sized universities had the highest pretest mean scores at Time 1 on a</p>	Small groups which focused on CT skills worked well with students. The results suggests students prepared in university settings versus junior colleges benefited the most from a scenario-based teaching strategy in the community health course. Educators must be cognizant of students' educational backgrounds and needs in order to design curriculum best suited to educate future nurses in various nursing education

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						<p>five subsets are calculated for critical thinking sum total with scores ranging from 0-80. Form A used at time of pretest (Time 1), and Form B was used at time of posttest (Time 2). WGCTA has been established by stable split-half reliability coefficients ranging from .69-.85. Validity has been established by using the test in a variety of</p>	<p>majority of the WGCTA subscales and the total score when compared with other student in the sample.</p> <p>Hypothesis 3 Students who had taken a majority of liberal arts electives showed a greater ability on the WGCTA assumptions subscale at Time 1 when compared with students who took a majority of science electives.</p> <p>The scores obtained on all subscales</p>	settings.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						settings and for different purposes.	ranged from 7-12. Prior to the intervention, the possibility of a ceiling effect was considered; however the scores were midrange, and thus significant differences in posttest scores.	
Platzer, Blake & Ashford (2000)	Reflective thinking will develop a higher level of critical thinking. Methods for promoting reflection at different stages of learning need to be increased.	To show that critical thinking skills can increase by discussion in a group discussion in a reflective group process, to learn more than empirical knowledge	Mezirow's Transformational Learning Theory (1990) Concepts: critical reflection	Convenience sample of 2 cohort of students in second year of study in a part time diploma program. There were four groups over years of study with between 6-10 members and	Descriptive design	Each of the 30 students participated in an in depth qualitative interview about experience. Individual interviews were audio recorded.	Ability to tolerate the perspectives of others demonstrates evidence of critical reflection which enabled students to undergo the perspectives transformation that is required to	Nursing education must incorporate teaching strategies such as reflective group practice as a means of fostering professionalism.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
	There is little empirical research which explores whether, and how, reflective thinking is developed.	and technical knowledge of work professional teaching and assessment is focused.		1-2 facilitators.			deal with others in a fair and equitable manner.	
Wheeler & Collins (2003)	Meaningful learning involves the assimilation of new concepts and ideas with a learner's previous experience. This type of learning is necessary for the development of problem-solving and critical	To examine the effectiveness of concept mapping as a strategy to help students develop critical thinking skills.	Ausubel's Assimilation Theory Concepts: Meaningful learning, Assimilation of new concepts into existing knowledge base.	Convenience sample (n=76) drawn from sophomore baccalaureate nursing student enrolled in an introductory course at a southeastern university in Spring 1998. Student were randomly assigned to experimental group (n=44) who used	Quasi experimental pretest-posttest design	A demographic questionnaire developed for the study was used to determine age, sex, level of education and previous use of concept mapping. The California Critical Thinking Skills Test	With respect to the CCTST, a significant difference ($p < .05$) was found between the mean pretest and posttest scores and each subscale between the two groups. Post hoc tests found differences between the groups to be insignificant. Experimental group mean	Findings suggest that concept mapping is an effective means of promoting meaningful learning and improving critical thinking skills in nursing students. Concept mapping should be considered an effective strategy for nurse educators to use to both develop and measure critical

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
	thinking. Concept mapping can facilitate meaningful learning.			concept mapping, or control group (n=32) who used traditional care plans. The majority of participants were females (95%). Ages of subjects ranged from 20-44 with 95% of subjects under 22.		(CCTST) was used to measure critical thinking skills for both control and experimental groups. Internal consistencies were computed for the CCTST using the Kuder-Richardson 20(KR-20) and were determined acceptable for an instrument of this type (Form A =.70) and Form B =.71). Face validity of the CCTST has been	pretest scores 16.93, SD=4.37 and mean posttest scores 18.02, SD=3.94. The experimental group scores improved significantly ($p < .05$) on the CCTST overall score and the analysis and evaluation subscales while the control group score improved significantly only on the evaluation subscale and declined significantly on the inference subscale.	thinking skills of students. Additional studies exploring the use of concept mapping as a means of fostering CT skills should be conducted to confirm results of this study.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						<p>established through comments of test takers and by assessing the questions. Construct validity is supported by inclusion of test items that reflect the definition of critical thinking by the Delphi Study. Construct validity has been confirmed by pretest and posttest experiments which showed improved critical thinking skills in individuals</p>		

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						who completed a critical thinking course as compared to those who had never taken a CT course.		
Khosravani et al. (2005)	Nursing education must utilize teaching strategies to encourage critical thinking skills in nursing students. Research on the use of group dynamics as a means to promote critical thinking is limited.	To determine the effect of group-dynamic sessions on critical thinking skills of baccalaureate nursing students	The conceptual framework was based on the definition of concepts of critical thinking and group dynamics.	Convenience sample of 60 randomly selected baccalaureate senior nursing students enrolled at Shaheed Beheshti Faculty of Nursing and Midwifery. Students were between 22-24 years old and had similar educational records. The	Quasi experimental	A questionnaire comprised of 12 questions and 4 clinical report forms designed according to the nursing process (Assessment, Diagnosis, Planning and Evaluation) were used for data collection. The form provided space for students to	No significant difference were noted between the two groups with respect to the previously discussed variables as well as age and academic standing ($p>0.05$). Total scores of critical thinking between the two groups, experimental and control, showed	Critical thinking is promoted through the use of educational opportunities such as group dynamic sessions.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
				majority of students in both groups were female, unmarried, with no occupation or experience with group work.		<p>write clinical reasoning in each step of the nursing process. The forms were used to measure students' clinical reasoning abilities and to evaluate critical thinking skills of students.</p> <p>Validity of the questionnaire was determined by content validity and internal reliability was measured by internal consistency (internal</p>	significant differences verified by a paired t-test ($p=0.0001$).	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						consistency 99.95). To identify reliability in rating, an inter-rater reliability was measured (inter-rater reliability 0.88).		
Tiwari et al. (2006)	While there is agreement among nurse educators as to the need for student's to develop critical thinking skills, differences of opinion exist as to best teaching methods to develop	To compare the effects of problem-based learning and traditional lecturing on students' critical thinking.	Lewin's Force Field Theory(1935, 1944) as it relates to human motivation	79 Year 1 nursing students at a university in Hong Kong. Students were randomly assigned to 1 of 2 parallel courses delivered	Randomized controlled trial	California Critical Thinking Dispositions Inventory (CCTDI). The CCTDI is a 75 item Likert scale tool with seven subscales : Truthseeking Openmindedness, Analyticity, Systematicity,	No significant differences in overall CCTDI scores were noted between the two groups at time of pretest (Time point 1). At subsequent time points scores were significantly greater for the PBL group than the traditional	PBL was more effective in enhancing CT skills than lecturing. PBL encouraged self-motivation and students are more likely to attain higher levels of CT when motivated to learn. Further research is needed to confirm findings.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
	critical thinking in students.					<p>Critical Thinking Self-confidence, Inquisitiveness, and Cognitive Maturity.</p> <p>The CCTDI measures positive, ambivalent, or negative dispositions towards critical thinking as evidenced by overall and subscale scores.</p> <p>Alpha reliability for the CCTDI is .91 with a range of .71-.80 for the subscale scores.</p> <p>The CCTDI</p>	<p>lecture group.</p> <p>Interview data revealed PBL students' actively participated in the learning experience and lecture student were passive participants in learning. PBL students believed PBL encouraged deeper thought and lecture students felt thinking was not encouraged in lecture.</p>	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						<p>was administered at 4 time points; prior to students' assignment to the PBL or lecture group, following completion of the PBL or lecture experience, after 1 year and after 2 years.</p> <p>Semi structured interviews were also conducted to obtain student perceptions of the PBL experience.</p>		

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
Hsu (2007)	Little research exists with respect to the use of clinical post-conference to promote problem-solving skills and improve critical thinking skills.	To explore nurse educators' perceptions regarding clinical post-conferences and to explore interaction characteristics between students and faculty in clinical post-conferences	Mezirow's Transformational Learning Theory	10 female nurse educators with masters' degrees (average of 5 years experience teaching, SD 3.5 years) and 50 students with an average age of 19 years (SD 1.6). The convenience sample was drawn from a two year nursing college in Tao-Yaun, Taiwan.	Descriptive	Participant observation, open-ended questionnaire which measure student of the teaching method, taped transcripts, and field notes in which procedures, body language and facial expressions were recorded. Data analysis: field notes were read and reread and NUDIST qualitative software program was utilized.	Seven of the 10 nurse educators believed effective learning and discussion were vital for an "ideal clinical conference." Student participation, discussion leadership, different teaching methods, teacher support and cohesion were mentioned. Educators recognized ward characteristics, learning goals and student needs should be considered when designing and	Educators who are oriented will not promote CT. Nurse educators must support clinical post conferences as a means of promoting critical thinking, problem solving and meaningful learning.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						<p>Transcripts were produced and coded by one trained observer and the researcher. Authenticity of data was confirmed through discussion with another observer who was an expert in clinical teaching. Interrater reliability was established at 85-93%.</p>	<p>evaluating conferences. The researcher references Letizia's (1998) six components of clinical conferences which include: order and organization, leading discussions using high level questioning strategies, different teaching methods, teacher support, and task orientation. The study found educators tended to emphasize discussion of clinical</p>	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
							<p>experiences most often. Questioning was used most frequently by educators. Most often (90% of the time, low level questioning was used which invokes low order thinking. Only three educators used high level questioning to lead discussions in post-conferences (6.8%) In addition , only three nurse educators made use of teaching methods such as role playing, experience</p>	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
							<p>sharing and assessment discussions(5.7%) Task orientation appeared most often 77.3%) Because of cultural factors, educators rarely expressed affective behaviors such as smiles, praise, support or friendliness to students. Teacher support was the least occurring element (1.1%).</p> <p>Reflection and use of high order thinking promoted critical thinking and</p>	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
							meaningful learning in post conferences.	
Yuan, et al. (2008)	Professional nurses need to develop critical thinking skills for situation specific problem-solving.	To determine if PBL is an effective teaching strategy for development of critical thinking, problem solving, and teamwork.	Concepts: Critical thinking, Problem-based learning	46 nursing students at a university in Shanghai, China. Student age ranged from 18-22 with 76% of the sample female and 24% of the sample male.	Quasi experimental two-group pretest-posttest	California Critical Thinking Skills Test	No significant differences in CT skills were found between the control group and the PBL group at the time of pretest ($p = 0.429$). Students who participated in the PBL group showed greater improvement on the overall CCTST and on the analysis and induction subscales when compared with the lecture group. 91% of students found	PBL stimulates and enhances learning. Nurse educators should consider PBL an effective strategy for promoting critical thinking in nursing students and better preparing students to provide sound clinical judgment. Additional research, a randomized control with a larger sample examining the effects of PBL on CT for the duration of a nursing

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
							PBL conducive to analysis of situations in various ways, creative problem solving, and sharing opinions with others.	program, is needed.
Beckie, Lowry & Barnett (2001)	Nursing education must prepare nurses to think critically for effective clinical judgment. Effects curriculum revision has on nursing students' critical thinking skills is unknown.	To evaluate whether critical thinking skills are attained by nursing student, And after revision of the curriculum.	Concepts: Critical thinking skills, baccalaureate nursing students, Curriculum revision	A convenience sample of three cohorts of students: Cohort 1(n=55) was baseline before curriculum revision, cohorts 2(n=55) and 3 (n=73) were first two classes to experience revised curriculum.	Longitudinal comparative pretest-posttest design	California Critical Thinking Skills Test (CCTST) was used to measure critical thinking skills at program entry, midpoint and exit. Internal consistency reliability estimates(KR -20) computed separately by	Cohorts 1, 2, and 3 were largely female (cohort 1, 89.1%, cohort2, 81.8%, and cohort 3, 86.3%) with average ages of 24.6, 25.8, and 26.4 years respectively. The majority of all cohorts were single (66.3%) and Caucasian (72%) students.	As cohort 2 improved dramatically on both total CCTST scores and all subscale scores, there does appear to be a correlation between the changes in curriculum and improved critical thinking skills in the students. Additional research which incorporates

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						<p>pretest and posttest for the 34 item instrument ranges from 0.68-0.70.</p> <p>A demographic data form developed for the study, was used to collect information related to gender, race, marital status, employment status, and prior instruction in critical thinking.</p>	<p>Cronbach's alpha internal consistency reliability on the CCTST total scores for each test and each cohort ranged from 0.55 to 0.83. All three cohorts were statistically significantly different on the total CCTST score ($F=10.04, p < .001$), the analysis subscale ($F=7.96, p < .001$), the inductive reasoning subscale ($F=9.28, p < .001$), the deductive reasoning subscale ($F=6.20, p$</p>	<p>nursing focused evaluation methods in combination with the CCTST to evaluate students' CT is needed.</p>

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
							<p><.003), the inference scale (F=7.96, P <.001), and the evaluation subscale (F=8.06, p <.001) which suggests increased critical thinking for all cohorts. Cohort 2 showed statistically significantly higher scores compared with cohort 1 on the total CCTST score (F= 18.58, p <.001), inductive reasoning (F=16.37, p <.001), deductive reasoning (F= 12.48, p <.001)</p>	

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							inference (F=12.98, p<.001) and evaluation (F=18.70, p<.001). Changes in critical thinking scores among the cohorts were most notable between test 1(test at program entry) and test 3(test at exit). A time and cohort effect was noted with respect to total CCTST score, analysis and inference: Cohort 2 improved dramatically, cohort 3 dropped dramatically and cohort 2	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
							remained unchanged. The lack of improvement in cohort 3 is attributed to “poor motivation” and distraction of the need for this group to prepare for the NCLEX.	
Shin et al. (2006)	Nursing education has focused on knowledge-based evaluation instead of critical thinking skills necessary for sound clinical judgments. Critical thinking dispositions	To investigate the critical thinking dispositions of baccalaureate nursing students at a nursing university in Korea.	Concepts: Definition of the concepts of critical thinking dispositions	An initial convenience sample of 60 nursing students was drawn from a baccalaureate nursing program in Korea. Of the 60 students, 32 participated in all four studies performed every March from 1999 to	Longitudinal descriptive comparative	The CCTDI: a 75 item Likert response questionnaire . CCTDI responses range from “strongly agree” to “strongly disagree”. This instrument also has seven subscales which reflect	Students showed positive dispositions during the 4 year study with scores above 280. The total CCTDI average scores were as follows: 289.78 (SD=14.42) for the 1 st year, 295.31 (SD=14.24)	Although there was improvement in the total CCTDI scores as well as many of the subscales over the course of the four year program, the findings of this study would indicate the current curriculum at this nursing program offers little to improve

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
	of nursing students effect outcomes in nursing education.			2002.		aspects of critical thinking dispositions: open-mindedness, inquisitiveness, truth seeking, systematicity, analyticity, self-confidence, and maturity. Total CCTDI scores may range from 70-420. An overall score of 280 indicated dispositional weakness, an overall score of 350 indicates dispositional strength. Internal reliability of the CCTDI	for the 2 nd year, 298.34 (SD=16.42) for the 3 rd year, and 300.66 (SD=17.50) for the 4 th year. Statistically significant improvement of critical thinking as students progressed through the nursing program (F= 7.54, p=0.0001). The subscales of open-mindedness (F=4.72, P=0.0194), self confidence (F= 4.72, p=0.0041), maturity (F=4.67,	the development of students' critical thinking abilities. Nurse educators need to examine teaching strategies which foster critical thinking to ensure sound clinical judgment.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						has been established at .91 and concurrent validity ($r=.66$, $p < .001$)	$p=0.0044$) showed statistically significant differences by academic year. There were no statistically significant differences in the subscales of truth-seeking ($F=1.92$, $p=0.1324$), inquisitiveness ($F=0.87$, $p=0.4607$), analyticity ($F=1.54$, $p=0.2085$, and systematicity ($F=2.53$, $p=0.0620$).	
Suliman (2006)	An objective of nursing education is to produce	To compare critical thinking dispositions and learning	Concepts: Critical thinking dispositions, learning styles	Convenience sample included 130 nursing students	Descriptive, comparative	Self administered questionnaire which included	With respect to learning styles, the four subscales of the Learning	It is important for nurse educators to consider both learning styles

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
	graduates who possess sound clinical judgment. Educators are concerned with students' critical thinking dispositions and learning styles which may impact on CT skills of students.	styles of traditional Stream I nursing students and accelerated Stream II nursing students.		attending the College of Nursing and Allied Medical Sciences of Saudi Arabia: Stream I, n=80 and Stream II n=50. The majority of Stream II students were biology graduates (60%), chemistry graduates (30%), with the remainder physics (6%) and math (4%) graduates. In previous education the majority of Stream II students (62%) scored		demographic data, Kolb's Learning Styles Inventory, and CCTDI. The alpha Cronbach reliability for the CCTDI overall was 0.85, and 0.74-0.86 for the subscales Cronbach alpha for the Kolb LSI was 0.78.	Styles Inventory (concrete experience, reflective observation, abstract conceptualization and active experimentation), MANOVA test revealed no significant difference between Stream I and Stream II ($F=1.58$, $p=0.1836$). Univariate F test did show the two Streams were significantly different on the concrete experience subscale ($F=5.797$, $p=0.017$).	of students and critical thinking dispositions in order to utilize appropriate teaching methods. Identifying ways in which students learn best will facilitate critical thinking.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
				between 80-90%. Only 18% score above 90% and the remaining 20% scored between 70-80%. In their high school exam the majority (58.2%) of Stream I students scored more than 90%, 40.5% scored 80-90% and 1.3% scored between 70-80%.			Stream II students were significantly more critical thinkers ($p=0.000$), inquisitive ($p=0.000$) and self-confident ($p=0.002$). The predominant learning styles of Streams I and II were the divergent and the convergent, respectively, with no difference except in relation to their learning abilities, namely, concrete experience ($p=0.017$) in favor of Stream I.	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
Rogal & Young (2008)	Critical care nurses process vast amounts of information and require well developed critical-thinking skills to make clinical decisions. Nurse educators need to address the need to develop critical thinking skills. Can these objective clinical judgments be taught if education is provided in	To determine if critical thinking skills of nurses enrolled in a post-graduate critical care course improved over time.	Concepts: Critical thinking	This purposive sample consisted of 31 nurses enrolled in the 2005 (15 nurses) and 2006 (16 nurses) course for critical care. Most of the participants were female (83.9%) and had 5.5 years (SD = 4.0) of general nursing experience and 2.3 years (SD = 2.8 years) of critical care nursing experience.	Longitudinal Comparative pretest-posttest	California Critical Thinking Skills Test (CCTST) was used to measure critical thinking skills at beginning of a 12 month course and at end of the course. The 34 multiple choice questions covering five subscales: analysis, evaluation, inference, inductive reasoning, and deductive reasoning. The total score	The CCTST revealed a mean 18.5 at the pretest and a mean score of 19.7 at the posttest. The posttest scores ranged from 7 to 32. No significant difference was observed between pretest and protest total scores of the critical-care nursing students (t (df=29), -0.7333; p=.4666). Comparison with the normative group showed that critical thinking means scores	Findings of this study indicate the majority of postgraduate students demonstrated slight improvement in CT skills. Educators must use teaching strategies and develop curricula to foster the development of critical thinking for sound clinical judgment in postgraduate education.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
	a post graduate setting?					possible ranges from 0-34.	were higher for the post graduate nursing students than the fourth year college students.	
Zygmunt & Schaefer (2006)	The amount of time and experience needed to facilitate the transition from thinking critically and possessing CT skills requires a combination of education that encourages CT, work experience, and mentoring. Educators	To determine the CT skills of nursing faculty and to examine the relationship between epistemo-logical position and critical thinking. The ability of students to engage in CT is directly related to types of questions	Conceptual framework is based on the definition of the concepts of critical thinking.	A randomized national sample of 300 FT nursing faculty from 60 NLN accredited schools excluding doctorate faculty. Mean age of faculty was 50.66 years (SD=6.61); 75% were female. The majority (78.4%) reported	Descriptive correlational	California Critical Thinking Skills Test (CCTST) 34 multiple choice instrument that measures critical thinking ability. Reliability was established with a Kuder-Richardson value of 0.68-0.75. The CCTST reliability	The CCTST indicated some variability of CT ability of the faculty. Mean total score of 19.14 (SD=6.76) was compared with the mean total scores of two norm groups of students. In the study sample, there was no correlation between the analysis score and the	The study is limited by the small convenience sample and by the LEP design, which is weighted in favor of classroom teaching. The design of the LEP is particularly important in light of fact that all but 3 examples provided by faculty members were clinical.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
	use teaching methods that do not increase CT ability which leads to the question of how well versed faculty are in the process of developing critical thinkers. Research is limited in assess the CT skills of educators.	posed by faculty.		having no formal CT education. Respondents reported teaching in different types of programs: 32.4% diploma/AD; 43.2% BSN, 21.6 MSN.		<p>coefficient for this study was 0.86.</p> <p>The Learning Environment Preference (LEP) assesses an individual's learning environment preference as an indication of epistemological position. The LEP has 65 items categorized into five domains: course content/view of learning, role of the instructor, role of student/peers classroom atmosphere /activities,</p>	<p>remaining subscale scores. Strong, positive correlations were found between the total score and the inference, evaluation, induction, and deduction subscales.</p> <p>LEP analysis indicates that no faculty viewed knowledge as absolute or dualistic as indicated by positions 1 through 3. However, no faculty achieved position 5, which is indicative of critical thinking. The</p>	If educators are to enable students' to think critically in the classroom and clinical settings, educators must possess adequate CT skills and utilize active teaching methods which promote reflection to enhance student ability to think critically.

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
						and evaluation procedures. Each domain instrument ranges from 0.63 to 0.84. Overall reliability for this study is 0.79.	<p>total score for the entire sample was 395.41 (SD=28.70), indicating position 4 which indicates the total and percentage of faculty within each epistemo-logical position.</p> <p>12 interviews were conducted with faculty who provided a clinical or classroom example of student use of critical thinking.</p> <p>The mean score on the CCTST</p>	

Source	Problem	Purpose	Framework or Concepts	Sample	Design	Instruments	Results	Implications
							indicated that most faculty were considerably more skilled at CT than the typical senior. The CCTST suggested that not all faculties were equally skilled at critical thinking, and findings from the LEP indicated that faculty had not developed intellectually to the point of CT.	